Types of Business Intelligence

This chapter introduces you to various types of BI. After reading this chapter you should be able to differentiate between various BI types and varieties of BI implementations. In case you are planning to start a BI initiative but are unsure about which type of BI has to be implemented, this chapter should clear any such doubts or confusion. Also, some of the misconceptions about real-time BI and self-service BI are demystified. It is expected that the reader has completed both the previous chapters as references are made to some of the concepts covered in previous chapters, and we continue to use the Walget example. It is expected that the reader is familiar with terms open-source software and proprietary software.

Structure

This chapter is structured as listed as follows:

- BI types based on various parameters
  - BI types based on type of analytics
  - BI types based on types of decisions
  - BI types based on solution hosting
  - BI types based on solution ownership
  - BI types based on type of software license

- o   BI types based on data freshness
  - ❖   Myths about Real-time BI
- o   BI types based on sectors
- o   BI types based on departments
- o   BI types based on BI integration approach
- Varieties in BI implementation
  - o   Agile BI
  - o   Out-Of-The-Box BI
  - o   Self-service BI
    - ❖   Myths about Self-service BI

Objectives

Getting to know various parameters based on which BI can be classified and understand the various types of BI. Understanding the advantages and disadvantages of **Business Intelligence as a Service** (**BIaaS**) over self-managed BI, and open-source BI over proprietary BI. Demystify some of the myths about self-service BI and real-time BI and understand when real-time BI is required and when it is not.

BI types based on various parameters

The types of BI depend on the parameter we choose for classification. There are various prefixes and suffixes that are attached to BI. Based on the type of analytics it can be classified into three different types, based on the type of decisions it can be classified into another three different types, and more. Under this section an effort has been made to cover as many possible types as listed below but do have in mind that there can be more possible types. Mobile BI is not considered as a classification but only an additional feature available in any of the following types and therefore it is not listed below. Distinction can be made between different BI types based on:

- Type of analytics
- Types of decisions
- Solution hosting
- Solution ownership
- Types of software license
- Data freshness
- Sectors

- Departments
- Integration approach

In the following sections each of the BI types is explained.

BI types based on type of analytics

BI can be classified as descriptive BI, predictive BI, and prescriptive BI based on the type of analytics capabilities it includes. This classification is based on the type of questions that the BI solution can answer. In some classifications, diagnostic analytics is added in the list as one of the types, but in reality, diagnostic analytics is a part or an extension of descriptive analytics. Diagnostic analytics answers the subsequent questions that come up based on the first level of output using descriptive analytics. The first level of descriptive BI provides information such as trends, patterns, correlations, anomalies, etc., about what has happened. The next level of descriptive BI, that is, diagnostic analytics, tries to answer the questions related to why something has happened. Diagnostic BI provides insights.

As explained in the *Chapter 1: What is Business Intelligence*, BI is an iterative process. At first it triggers ideas or questions in the minds of the decision makers, then by interacting with the BI solution, for example, by drilling up/down, filtering, slicing, and dicing the information, the decision maker is able to get to the answer why something has happened. So, we can actually exclude diagnostic BI as a separate type and include it as an extension of descriptive BI as shown in the following *Figure 3.1*. In this book, where descriptive BI is mentioned, it includes diagnostic BI.

Types of BI based on Analytics

What happened?

What could happen?

What should be done?

Descriptive BI

Why did it happen?

Predictive BI

Prescriptive BI
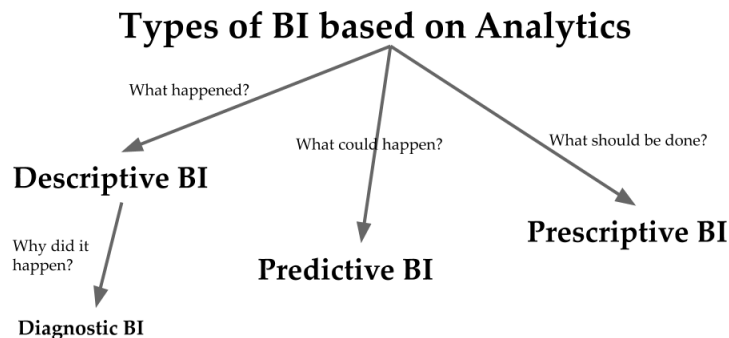
Diagnostic BI

Figure 3.1: BI types based on type of analytics

In the past, most of the popular BI frontend tools were limited only to descriptive analytics. For predictive analytics and prescriptive analytics use cases businesses had to buy/build additional specific tools. However, now[23] most of the BI frontend

tools include both predictive and prescriptive analytics capabilities too. As discussed in *Chapter 1, What is Business Intelligence*, BI is a concept, it is a process, and not limited to any particular tool or technology or features. As new capabilities emerge due to technological advancements which further support deriving information and insights from data, they are automatically included under the BI umbrella. With these changes this particular categorization of BI based on type of analytics is blurring and won't be necessary in the next few years as by default all three types of analytics capabilities will be available in all of the BI frontend tools. However, for the sake of completion it has been included here. In *Chapter 2: Why do businesses need BI*, we have already covered the three types of analytics and therefore will not be explained again here. The following *Table 3.1* compares the types of BI based on the type of analytics.

	Descriptive BI	**Predictive BI**	**Prescriptive BI**
Capabilities	Provides information and insights about what has happened based on available data. And with the extension of diagnostic capabilities, it provides insights on why something has happened.	Predicts or forecasts the future based on past (available) data, based on known trends and patterns. Derives value of an unknown variable based on relationships identified in available data.	Prescribes which options should be opted for course correction or alignment with requirements. Provides information about which is the best option to take to get to the desired result.
Examples	How many customers shopped at Walget store in location xyz last Sunday? Why did one of the regions have a spike in the number of transactions?	How many customers are expected to shop at Walget store in location xyz next Sunday? Which Walget customers are most likely to switch to online shopping from brick-and-mortar shops?	What should be the discount percentage on product abc to get maximum profits in the next three months? How many temporary workers should be recruited for the predicted peak season?

Table 3.1: *BI types based on type of analytics*

In *Table 3.1* we have used the words predict and forecast. Most people use these terms interchangeably. However, there seems to be a difference between forecasts and predictions. In the case of forecasts, it considers current state and calculates future state, time series (continuous time dimension) is involved. State or value of a subject in question such as weather, sales, economy, etc., in a specific point in time in the future depends on the current state/value and the subsequent state/value of that subject at equivalent time intervals up until that specific point in time in the future. Whereas all predictions need not necessarily consider the current state nor calculate, and time series may not be involved. Predictions could also be about discrete events. For example, to predict whether a specific customer will default a loan or not, which country will win the football world cup, who will win the election, which item will a customer purchase after purchasing another item, etc. So all predictions are not necessarily forecasts, but all forecasts are predictions. Forecasts are a subset of predictions or in other words predictions are generic, and forecasts are predictions in which current state is considered and future state is calculated for equal time intervals.

BI types based on types of decisions

In the past, BI was mainly intended only for top level management for making strategic decisions. Over the years, top management across businesses and sectors have realized the value of BI, and at the same time the cost of BI solution implementation and operations has reduced drastically. Both of these factors largely have led to enabling all levels of management to use BI in most businesses. And now, even day to day operational decisions by first-line managers are also made with the support of BI. In general, the number of BI users increase as we go from strategic to tactical to operational decision making as depicted in *Figure 3.2*.

Figure 3.2: BI users at different levels

In *Chapter 2: Why do businesses need BI?* we discussed the types of decisions that are made using BI. This classification of BI is simply based on different types of decisions such as strategic, tactical, and operational decisions which the BI solution is able to support. It's not uncommon to find multiple BI solutions within the same organization to support each type of decision or the same BI solution built in such a way that it supports all types of decision making for all relevant and authorized users. In *Table 3.2* we reuse the questions that were shared in *Chapter 2: Why do businesses need BI* to indicate the type of questions the BI solution should be able to answer with the backdrop of Walget.

Strategic	Tactical	Operational
Which products should we invest in the long term? In which locations should we launch new stores? Which stores should we close down in the long run?	Which promotion/campaign should we repeat or launch to meet yearly targets? How many stores should we upgrade to new technology in Phase 1? In which location should we conduct more training?	Which products should we stock for the holiday season? How many part-time staff should we hire for the weekend? Which products should be part of the clearance sale? What should be the discount percentage?

Table 3.2: BI types based on type of decision making

It is to be note that the types of decisions which the BI solution can support decision makers depends on the availability of the required data in the BI solution for such decisions.

BI types based on solution hosting

Based on whether a BI solution is hosted on-premises or on in the cloud, it can be classified as on-premises BI or cloud BI, respectively. BI solutions consist of four main logical layers as listed below:

- Data acquisition layer
- Data processing layer
- Data storage layer
- Information presentation layer

In some BI solutions, right after the data is acquired it is first processed and then stored whereas in some other solutions the acquired data is stored first without

processing and then processed later within the storage layer. The former is the well-known **extract, transform, and load** (**ETL**) approach and the latter is the **extract, load, and transform** (**ELT**) approach which has already started gaining popularity. The four main logical layers of a BI solution that fits both the approaches is depicted in *Figure 3.3*.
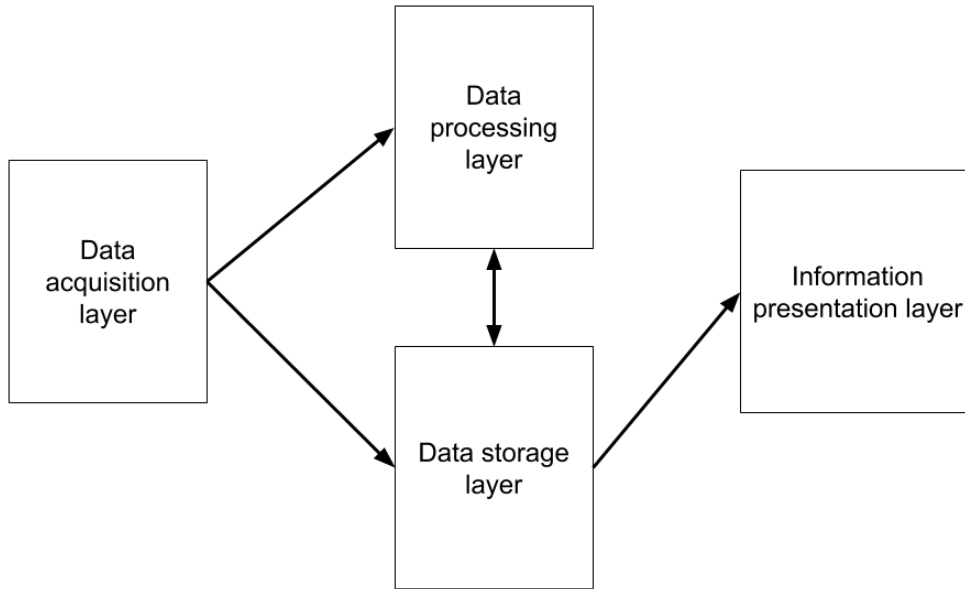

Figure 3.3: 4 logical layers of BI

Based on where these four logical layers are hosted, on-premises or on the cloud, BI solutions can be broadly classified into three different types:

1) On-premises BI
2) Cloud BI
3) Hybrid BI

In cloud BI there are multiple variants based on various cloud models such as **infrastructure as a service** (**IaaS**), **platform as a service** (**PaaS**), and SaaS. Within the hybrid BI type there are multiple subtypes based on where each of the logical layers of a BI solution is hosted. In *Table 3.3*, we differentiate between the three types and also show two of the variants among many more of the hybrid BI type.

	On-premises BI	Cloud BI	Hybrid BI	
			Hybrid BI–1	Hybrid BI–2
Data acquisition	On-premises	Cloud	On-premises	On-premises
Data processing			On-premises	Cloud
Data storage			Cloud	Cloud
Information presentation			Cloud	Cloud

Table 3.3: *BI types based on solution hosting*

Note that it is very much possible to run multi-cloud BI solutions. For example, the data acquisition layer, data processing layer, and data storage layer could be on cloud services provided by a certain cloud services provider (e.g. AWS - Amazon Web Services) different from the provider (e.g. GCP - Google Cloud Platform) where the information presentation layer is hosted. However, there needs to be a compelling reason to choose a multi-cloud approach as it introduces relatively more complexity for administration, operations, and maintenance, and the level of complexity varies based on the chosen cloud model.

BI types based on solution ownership

Based on BI solution ownership, BI can be broadly classified into self-managed BI and **BIaaS**. BIaaS is a commercial model in which a vendor provides a BI solution as a fully managed service to multiple customers on a subscription basis. When companies use BIaaS they don't need to retain the technical part of the BI team in the company as all of the technical BI work is carried out by the service provider. The customer could still retain BI analysts and data analysts who use the BI solution but don't usually build the BI solution themselves.

In case of self-managed BI, the BI solution is owned by the business (Walget for example). Even if some or all of the components are hosted in the cloud it could still be termed as a self-managed BI solution if the administration and management of the cloud services is done by the business itself. A self-managed BI solution could be managed entirely by an in-house BI team or by a combination of in-house BI and

external teams or entirely by team/s of externals, for example by employees of an IT service provider as depicted in the *Figure 3.4*:
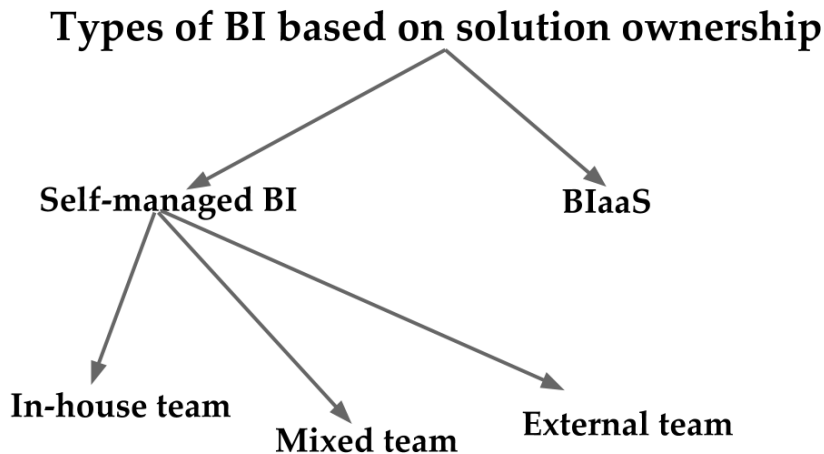
Types of BI based on solution ownership

Figure 3.4: Types of BI based on solution ownership

There are both advantages and disadvantages of using BIaaS over self-managed BI, these are captured in *Table 3.4*:

	Self-managed BI	BIaaS
Time	Relatively longer implementation time.	Shorter implementation time.
Cost	Expensive. Much higher total cost of ownership.	Cheaper. Lower total cost of ownership.
Staffing	Dearth of skilled BI team members. Resources split between core business applications and BI.	Abundance of BI specialists therefore allowing businesses to focus on their core business application.
BI maturity	Low to medium. Not realizing full potential in data through BI.	Medium to high. Based on experience in similar markets or businesses, the specialists are able to derive more value from data and provide more value through BI solutions.
Best practices	Lesser number of implementations of best practices.	Higher number of implementations of best practices.

Scale	More difficult to scale unless using cloud services.	Easier to scale as BIaaS is mostly based on cloud.
Data security	Reduced risk of data security. Data does not have to be shared outside the business.	Increased risk of data security. Data has to be shared to servers that are managed by a third party.
Dependency	Lower dependency on third party providers.	Very high dependency on third party service providers.

Table 3.4: Self-managed BI vs BIaaS

BI types based on type of software license

Based on the type of software licenses used in a BI solution, BI can be classified broadly into three types:

1. Proprietary BI or commercial BI

2. Open-source BI (OSBI)

3. Mixed-source BI

As we have seen earlier, a BI solution mainly consists of four logical layers. This classification of BI types is based on the license type of the software used to fulfil requirements of each of the four main logical layers. Let's take a look at the differences between each of the BI solutions based on the type of software license in *Table 3.5*.

Proprietary BI	Open-source BI	Mixed-source BI
Only commercial or proprietary or closed-source software used for all layers. For each layer it could be different proprietary software from different vendors.	Only open-source software used for all layers. For each layer it could be a different open-source software.	Combination of both proprietary software and open-source software used in the same BI solution. Note that in the same BI solution, for the same logical layer, a combination of open-source software and proprietary software can be used.

Table 3.5: BI types based on software license

Open-source BI: A BI solution that is built using only open-source software is referred to as **OSBI**. To be clear, by open-source software it is not meant that the software is

free but that a business such as Walget can have access to the software's source code and modify it as required. There is of course software that are both open-source and free (zero cost) which can also be used in building a BI solution and it would still be referred to as open-source BI. Now an increasing number of companies are building BI solutions using entirely open-source software.

Proprietary BI: When all BI solutions were built using proprietary software, the term proprietary BI did not exist as there wasn't a need to differentiate. With the advent of open-source software and the usage of open-source software in BI solutions a need arose to make distinction between OSBI and proprietary BI. In my own experience, we did not use the term proprietary BI because in every project at every organization it was always proprietary software that was used for all layers. The solution was simply referred to as BI solution.

Mixed-source BI: BI solutions include multiple software in it. One of the responsibilities of a BI architect is to recommend or select one or more suitable and cost-effective software that fulfils the requirements of a data acquisition layer, processing layer, storage layer, and information presentation layer. For one of the layers open-source software could be the best option and for others it might be proprietary software that works better. The choice of software depends on various aspects that are specific to the organization. Some of the BI solutions which previously had only proprietary software are being complemented with open-source software and the other way around. In mixed-source BI there can be several variants based on usage of open-source or proprietary software or both in the four layers of the BI solution.

Table 3.6 provides examples of different software that can be used to fulfil requirements of each of the logical layers of a BI solution from each category. In the mixed- source BI, it is limited to only 2 variants, but other variants are also feasible.

	Proprietary BI	**Open-source BI**	**Mixed-source BI**	
			Variant - 1	**Variant - 2**
Data acquisition	IBM DataStage, Informatica, Ab initio	Pentaho Business Analytics CE, Talend Open Data Studio	IBM DataStage, Informatica	Pentaho Business Analytics CE, Talend Open Data Studio
Data processing	IBM DataStage, Informatica, T-SQL	Pentaho Business Analytics CE, Talend Open Data Studio	IBM DataStage, Informatica	Pentaho Business Analytics CE, Talend Open Data Studio

Data storage	MS SQL Server, Oracle Exadata	MariaDB ColumnStore, Apache Druid	MariaDB ColumnStore, Apache Druid	MS SQL Server, Oracle Exadata
Information	SAP Business Objects, MicroStrategy	Pentaho Business Analytics CE	Pentaho Business Analytics CE	SAP Business Objects / MicroStrategy

Table 3.6: BI types based on software license

There are both advantages and disadvantages of using OSBI over proprietary BI as captured in *Table 3.7*:

	OSBI	Proprietary BI
Cost	Zero or low cost for software. Higher people/talent costs as more skilled workforce is required to deal with complexities. As there is no license cost, cost does not increase as the number of BI users increases.	High cost for software. Lower people/talent costs as proprietary BI tools are usually easier to use tools and abstracts complexity. Usually, there is a license per BI user and therefore cost increases as the number of BI users increase.
Vendor	No vendor lock-in.	Vendor lock-in.
Bugs and feature request	No dependency on vendors. If a business has a technical team, the team can fix bugs and add new features.	Dependency on vendors to fix bugs or adding new features.
Customization	Better suited for customizations. Modules that are not required can be removed.	Difficult to customize. Some requirements can be met through configuration. Some modules even if not required cannot be removed. Unpacking the software is usually not an option as warranty can be lost.

Capabilities	In most cases OSBI software contains lower number of features compared to proprietary software.	Usually comes with more features than open-source software.
	Usually, UI, especially GUI, are not good enough for use by business users. Requires some development effort to make it usable.	User interface is well developed and intuitive.
New features	New features are usually released later on or are included in the community editions later than commercial versions.	Features are released and made standard features based on demand and internal innovation by vendors.
Path to action	Usually, the software has to be enhanced before use. Time needs to be allocated for developing the tool before it can be put to use.	As most of the features are already packaged as part of the software, the BI team can focus on using the tool instead of developing the tool.
Staff skill level	Need staff who are able to code/program.	Need staff who are able to design using the tool and configuration.
Support	In most cases only voluntary community support is available. Unreliable support. In some cases, third party support on paid basis is available.	Usually high-quality reliable support through software vendors is available. Additionally, third party support on paid basis is available.
Documentation	Usually, only poor or scattered documentation is available. Documentation is mainly for technical audience.	Good, reliable and centralized documentation is available. Documentation available for both business users and technical users.
Reliability	In general, less reliable compared to proprietary software.	More reliable than OSBI.
Scalability	Usually requires upgrading to enterprise editions (supported editions).	Built for large businesses by default.
Integration with other tools	Usually doesn't come integrated with other tools.	Good support for integration with other commonly used tools such as LDAP, SSO, SharePoint, Excel, etc.

Table 3.7: OSBI vs Proprietary BI

BI types based on data freshness

Data freshness is the duration between the time of data generation as part of any business transaction/event and the time data is available for BI purposes as shown in *Figure 3.5*:
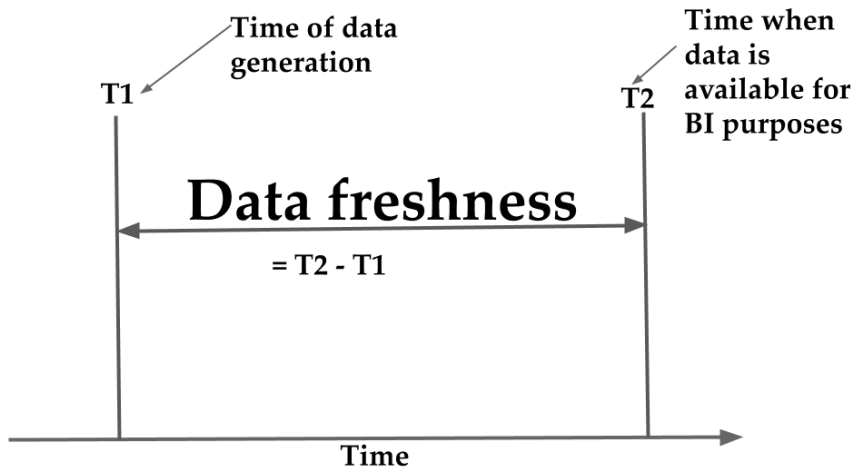

Figure 3.5: *Data freshness*

Based on how fresh the data is, which can be seconds, minutes, hours, or days old—BI solutions can be classified as real-time BI and traditional BI/non-real-time BI. In real-time BI there is a negligible duration (less than a second) between a business transaction and that transaction data availability for BI purposes. To avoid confusion, it is not only that transaction data that is required but all the transactions data of the past accumulated up until that point. Again, this is one more classification that exists more for historical reasons than what reflects the current reality. Historically, most BI implementations were limited to a batch-oriented process, that is, data of the previous day was processed on daily basis and stored in the data warehouse to be made available for the decision makers. As the demand increased for fresher (lower latency) up to date data, various solutions were developed and implemented to process and store data in real-time and make it available for BI users with minimum data freshness duration. While we are on this topic, let's clear some of the myths related to real-time BI as listed below:

1. Real-time BI is a new concept

2. Real-time BI is a must have

3. Strategic decisions require real-time BI

4. Without real-time BI there is no use of BI solution

There could be more number of myths about real-time BI, however, clarifying these four is expected to clarify others as well.

Myths about real-time BI

Myth 1: Real-time BI is a new concept

Some businesses had implemented real-time BI solutions many years ago. For example, even before 2011 there were vanilla BI solutions like BMC Analytics for BSM that provided real-time BI. In 2009, in a fleet management company that I worked at, we had something called **Real Time Reports** (**RTR**) as part of the BI solution, it was a set of reports that contained information about workshops and technicians' allocations, which was actually refreshed every 15 minutes as the minimum time slots were 15 minutes. These examples are provided to drive home the point that real-time BI is not something new, it has been around for many years. However, not all businesses had implemented real-time BI, and in most cases, it wasn't actually required for those businesses or was not viable.

Myth 2: Real-time BI is a must have

No. Some businesses don't need to have real-time BI. Relevant information should be made available at the right speed at which decisions can be made. For example, if the users of BI are limited in their capacity and can look at the information only once a day to compare the daily trend of the last 7 days there is no point in refreshing the data continuously, especially when additional investment is required to get that capability.

Myth 3: Strategic decisions require real-time BI

No. Strategic decisions don't necessarily require real-time BI. Real-time BI is for supporting operational decision-making more than any other type of decision-making. Of course, real-time BI can be used for other types of decision-making such as tactical and strategic too but it is not mandatory to have data in real-time for such decisions, batch load or traditional BI will also suffice. For example, Realtime reports within Google Analytics fall under operational BI, the user of these Realtime reports is a web analyst. You don't expect a CEO or a CFO of a multi-billion-dollar company to continuously monitor web usage all day long. For strategic decisions, it is not the instant data that is required, but historical, clean, integrated, and trustable data.

Myth 4: Without real-time BI there is no use of BI solution

While real-time reporting and dashboarding capabilities add to the list of capabilities of BI solutions and enables to take immediate actions as the events are occurring, BI solutions backed by data warehouses that are batch fed are still very much relevant and useful for management. Some of the decisions can only be based on longer term accumulated and calculated data.. The recent event[26] of TikTok app rating falling to a 1.2-star rating from 4.5-stars is a good example. The rating was down only for a

few days before Google intervened. Depending on the type of decisions that need to be made, impacted businesses will either include or exclude that 1.2-star rating. If all decisions were made just based on the 1.2-star rating at that point (short-term data), it could lead to wrong results.

Let's look at the preceding example in a generic way with data. In *Figure 3.6*, we have visualized the rating data of 2 mobile apps—App1 and App2 over a 6-month period.
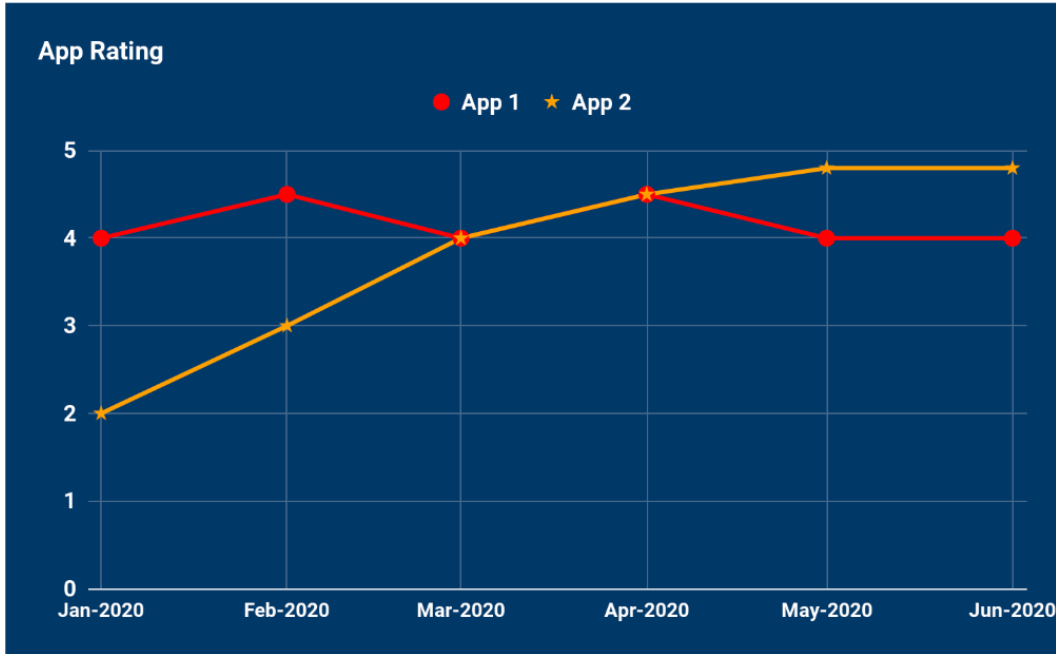

Figure 3.6: Example of rating of two apps

Let's assume that the rating of App2 fell to 2 stars on 7th May 2020. Even then the average for May doesn't go below 4.41 assuming that for all other days App2 had at least 4.5 stars. So, making a conclusion on 7th May based on only recent data that App1 is better than App2 for a strategic decision could lead to wrong actions whereas for an operational decision it might make perfect sense. There is more uncertainty about data that can change through the day than older data that has less chances of changes. So for tactical and strategic decision it is ok if up-to-date data is not available and data is a day old, thus making non-real-time BI still relevant.

BI types based on sectors

BI solutions are also classified based on sectors or industries. These are BI solutions that are specifically built for targeting customers in those sectors. For example, BI for banking, healthcare, manufacturing, retail, energy and utilities, telecommunication,

travel, etc. Some of the BI vendors offer out-of-box reports, dashboards, and other capabilities that are specific to these sectors. Businesses can start with out-of-box features for BI purposes but do note that some customizations are definitely required. Every organization is different even if they are in the same sector and therefore customization is usually unavoidable. Some service-based companies offer sector-specific BI solution frameworks and accelerators, developed based on years of experience of implementing solutions for multiple businesses, which speeds up and provides the right direction for BI solution implementation. These are also marketed as sector-specific BI. Depending on the specific needs of a business, a business may decide to implement a generic BI solution, a sector specific BI solution, or both.

BI types based on departments

BI solutions are also classified based on the targeted department or function. These are BI solutions that are specifically built targeting a specific department such as marketing, sales, human resources, customer care, IT operations, finance, supply chain, etc. Similar to BI types based on sectors, some BI vendors offer out-of-box reports, dashboards, and other capabilities that are specific to those departments. The benefit of these specific BI solutions (both sector specific and department specific) is that a business can start with pre-built dashboards and reports right away and customize it as per their needs instead of starting from scratch, thereby saving time.

BI types based on BI integration approach

Based on integration approach, BI can be classified as embedded BI and standalone BI. The Atlassian Jira dashboard that comes with the Jira application (Jira is a powerful work management tool for all kinds of use cases, from requirements and test case management to agile software development.) is a good example of embedded BI. Similarly, any application where data is visualized for analysis within the application such as HR analytics or supply chain analytics are also classified as embedded BI.

Embedded BI is about providing BI capabilities as part of the business application instead of as a separate BI application. In case of standalone BI, the BI application is different from the business application (source system/s) in which the data is generated. In *Table 3.8*, we'll compare embedded BI with standalone BI.

	Embedded BI	Standalone BI
Type of decision-making	Mostly operational and sometimes tactical, rarely strategic.	All 3 (strategic, tactical, and operational).
Data warehouse	Usually no data warehouse.	Most often backed by a data warehouse.

Residence of data	Same data as the business application data or aggregated data which co-resides together with the main business application data.	Data is copied over from source application to data warehouse in most cases. BI frontend sources data from data warehouse and usually not from source applications.
Data integration	Usually there is no data integration across multiple application. Limited to data from one application.	Data is acquired from multiple data sources and therefore data is integrated before use.
Scope of BI capabilities	Only as much BI capabilities as required to deal with the data within the application.	BI capabilities are generic. Can be used on data from any of the data sources.
Data freshness	Real-time. Data is available as soon as the transaction is completed.	Batch, near-real time and real-time. For achieving real-time data access, BI solution is directly connected to the OLTP application data, although it is an approach that is usually avoided, not impossible.
Sector specific or generic	Mostly sector, domain, or application specific.	Mostly generic and rarely sector specific.
Type of analytics	All 3 (descriptive, predictive, and prescriptive).	All 3 (descriptive, predictive, and prescriptive).
Advantages	Users don't have to switch between applications. BI capabilities seem to be part of the source application itself. Data used for BI is always in sync with application data.	Data specialists deal with data challenges and build scalable solutions. Reusable with other application's data. Better suited for BI usage. Easier to include other data sources and get a better overview.

Disadvantages	Application performance can be impacted due to BI usage. Siloed information. Limited BI capabilities.	Dependency on a separate (BI) team that is usually different from the team that develops the source application and therefore possible delays due to other priorities for BI teams. Chances of data not being in sync between source application and BI solution.

Table 3.8: *Embedded and standalone BI comparison*

Varieties of BI implementation

In the previous section we dealt with various types of BI based on different parameters. In this short section we will look at varieties of BI implementation which cannot be easily grouped into any of those types dealt previously. These varieties of BI listed below are based on how the BI solutions are built.

- Agile BI

- Out-of-the-box BI

- Self-service BI

Let's now go through the details of each of these types of BI.

Agile BI

Similar to how other IT solutions were developed, BI solutions were also built using Waterfall methodology. BI projects were known for multi-year complex projects that most often were delayed further or did not end well or were scrapped in between or did not yield expected results. Even those that succeeded built static reports that would perfectly answer questions that were pre-defined but would require a code change and a deployment to answer a previously unasked question. So, there were problems with both; the approach in development and the deliverables/functionalities available in the BI solution.

Agile BI is in a way a solution to solve those two aforementioned problems. Based on my own experience, it was around the end of 2000s that agile BI started gaining popularity. Agile BI is basically a combination of applying agile development principles in developing BI solutions in smaller but scalable modules with quicker ROI, responding to business changes with quicker implementation compared to traditional approaches, and building functionalities such as self-service BI and

interactive dashboards. This enabled business users to respond to business questions quicker than traditional ways. There is absolutely no question that agile BI is the way to go ahead with BI solution implementation. In *Chapter 7: Ideas for Success with BI*, we will cover more on this topic, especially about agile KABI.

Out-of-the-box BI

BI solutions that come pre-packaged with a set of reports, dashboards, and other BI functionalities for specific applications such as CRM, ERP, HR modules, etc., and are ready for use right after installation and configuration are known as **out-of-the-box BI** (**OOTB BI**). This is different from the approach of custom development of a BI solution.

BMC Analytics for BSM, Oracle OOTB BI for financials and HR are examples of OOTB BI. BMC Analytics for BSM is separate from the BMC Remedy application. The main advantage of OOTB is that it saves time and effort for businesses as most of the reports and dashboards which otherwise would have to be custom developed by businesses are prebuilt, for example, BMC Analytics for BSM has over 100 pre-built reports. These 100+ reports could easily take at least 200 person days if they had to be built from scratch. The other advantage is that these reports are built by people (vendors) who understand the underlying data model of the application for which the OOTB is built and therefore the reliability of the reports is higher. As and when the applications are upgraded, the OOTB BI is also upgraded by the vendor.

Side note: While I was writing this book, it was interesting to find out that BMC Analytics for BSM and BMC Dashboards for BSM, both based on SAP Business Objects, are nearing its end-of-life and they are already being replaced with BMC Remedy Smart Reporting based on the Yellowfin platform. The point to grasp here is, BMC, by keeping the main application (Remedy) separate from the OOTB BI that it offered, is able to change OOTB BI's underlying platform from Business Object to Yellowfin with probably no change to the main application.

Let's summarize the differences between OOTB BI and custom-built BI solutions in *Table 3.9*:

OOTB BI	Custom-built BI
Pre-built reports, dashboards, and other BI functionalities, ready for use immediately after installation and configuration.	Built from scratch using either proprietary software or open-source software or combination of both.
Usually is specific for an application or a few applications that are packaged together such as HR module and CRM from the same vendor.	Usually is built as a generic solution to work with any of the source application's data.

Saves businesses the time they would have otherwise spent.	Takes time to build.
Higher one-time costs for the software as it also includes the costs for the pre-built reports, dashboards, and other functionalities. However, the costs in comparison to custom-built will be lower as vendor sells it at a lower price due to sale volumes (vendor can sell it to multiple customers).	Lower one-time costs for the software as no pre-built reports, dashboards, etc., available. However, higher development cost as it is custom-developed specifically for an organization.
As solutions are built by vendors who are specialists in that field, they leverage their expertise.	Staff developers have to go through a learning curve.
Dependency on the vendor for updates and upgrades.	No dependency on the source application vendor.

Table 3.9: OTB BI vs Custom

In case you are thinking, isn't OOTB BI not the same as embedded BI? No, it is not. But as there could be some confusion about the differences between embedded BI and OOTB BI, let's clear those in *Table 3.10*:

Embedded BI	**OOTB BI**
Integrated (tightly coupled) with the main application.	Loosely coupled with the main application after it is bought.
It is usually part of the main application. Pre-integrated by the vendor.	Is a separate module. Data integration and not application integration. Integrated by the customer or professional services of the vendor or by IT services/system integrator companies.
Is provided by the same vendor as the source application.	Could be provided/sold by any vendor and not necessarily the vendor of the source application.
Specific for that application (source application).	Could be for one or more source applications.

Table 3.10: Embedded BI vs OOTB BI

In *Table 3.10*, what do we mean by provided by the same vendor or any vendor? For example, Walget depends on an employee attendance tracking solution to monitor and follow attendance of its employees. This attendance tracking solution is provided by a vendor X. If X integrates (embeds) BI module as part of the attendance tracking solution and provides it to Walget as part of the attendance tracking solution that's embedded BI as it is developed by the same vendor. If vendor Y collaborates with vendor X and builds a separate BI module that can be bought separately and configured to work with the attendance tracking solution of vendor X that's OOTB BI.

Self-service BI

Self-service BI (**SSBI**) was hyped by some of the BI vendors to be the magic bullet that would solve all of the problems faced by the end users of BI. Starting from around 2010 business managers were almost convinced by claims of a few BI vendors that with SSBI there is no more a need for a BI team, end users can have all that they want without having to wait for BI teams to build reports, dashboards, etc. But even now in 2020 we can see that BI teams are very much in demand and the demand continues to increase. So, what happened with SSBI? Let's first define SSBI. And then let's answer some questions and demystify some myths related to SSBI.

Self-service BI is a set of features in a BI solution using which authorized end users are able to analyze data interactively to get to information and insights on their own. Capabilities include data profiling, data visualization, create new artefacts (reports, dashboards, etc.), edit existing artefacts, add new simple to medium complexity data sources, schedule reports, drill down/up, explore data, etc., without breaking any of the existing artefacts, without having to code and without involving services of IT or BI team. Here end users refer to non-IT users such as marketing managers, sales managers, finance heads, and VPs.

SSBI is one of the means through which a BI solution becomes an agile BI solution. SSBI has become a standard feature in almost every BI solution. However, there are quite a few myths associated with SSBI. Here we will try to clear at least some of the myths or misconceptions about SSBI as listed as follows:

- Self-service BI are deployed and operated by non-IT business teams.

- Self-service BI is a new set of features and not available in traditional tools.

- Once SSBI is installed and configured there is no need for a BI team or IT.

- Objective of SSBI is to free up BI team/IT team.

- SSBI works on a standard laptop and therefore no server installation is required.

- All SSBI users have access to all data

Let's now go through each of these.

Myths about self-service BI

Remarks on each of the myths about self-service BI are provided as follows:

Myth 1: Self-service BI are deployed and operated by non-IT business teams.

Incorrect. End users make use of SSBI, they are not responsible for deploying, configuring, operating and maintenance of the SSBI platform. Installation, configuration, operation and maintenance are all activities performed by IT or BI administrators.

Myth 2: Self-service BI is a new set of features and not available in traditional tools.

Incorrect. Self-service BI is not a new set of features, some of the features were available even before 2010. If some businesses still don't provide SSBI functionalities to its users, it's not because of the tool, it's simply because of the bad implementation or internal policies. This is the very reason I have intentionally not provided a table that shows differences between a traditional BI and SSBI. For example, from my own experience Business Objects Webi was available well back in 2008, using Deski (thick client) and Webi (web-based) end users were able to view, edit and create their own reports, drill down/up, slice and dice the data. Some of the advanced users were even modelling the semantic layer.

Myth 3: Once SSBI is installed and configured there is no need for a BI team or IT.

Incorrect. The IT team, especially BI team, is still required. No end user (business user) is usually going to develop ETL jobs to load a database on a daily basis. It is not end user's responsibility to clean the data for all use cases. Using SSBI end users are able to clean/transform data to a certain degree using the data wrangling features but complex transformations, historization of data, etc., is not something the end user is meant to do. BI teams continue to design and implement data warehouses, configure, and administer such that only authorized users have access to data.

Myth 4: Objective of SSBI is to free up BI team/IT team.

False claim, even if this was to become true in the future, it is not useful in my view. The argument that SSBI ensures that a business user can free up the time of an IT person is equivalent to the argument that you can cook your own food in a restaurant to free up the time of the cook. What else is the cook supposed to do? To stretch the example a bit more, "*you can also purchase the ingredients to cook at the restaurant to free up the time of the restaurant owner or purchase manager*". Some questions that business users should ask themselves are, "Isn't a VP's or EVP's or CXO's time more expensive than a BI team member in most cases?", "Would senior management personnel decide to spend their time in front of the system analyzing data or would they rather delegate it to a specialist like a BI analyst or data analyst?",

"So why should a business user free up time of BI or IT team?" Objective of SSBI is to enable business users to be able to get to the right information at the right time.

Myth 5: SSBI works on a standard laptop and therefore no server installation required.

Not entirely correct. Yes, some of the SSBI tools can be installed on a standard laptop and used as long as the data is within the limits (CPU, RAM and storage capacity) that the laptop can process. As soon as there are billions of rows in the dataset these tools hang or crash. Most BI tools have a web-based interface to enable users to use SSBI functionalities using the compute power and RAM capacity of the server. Currently a standard laptop of an end user may have 16 GB RAM whereas a decent BI server has between 256 GB to 1 TB RAM. So, for many use cases of BI, a standard laptop will not be sufficient, there is a need to install SSBI platforms on the servers.

Myth 6: All SSBI users have access to all data.

Incorrect. SSBI is also enabled by the IT or BI team and access to data is governed by the data governance policies. Even if users install a desktop-based tool on their own they still cannot have access to all of the data in a company unless connections are permitted/authorized to the data sources. Any company of a decent size would ensure that only authorized users have connections to the right set of data. So, this notion that SSBI enables all users to have access to all data is really misleading.

Concluding remarks on SSBI

While SSBI is very important, bestows more power in the hands of business users, provides a lot of value and all BI solutions should definitely include SSBI, to state that BI teams or IT teams are not required is far-fetched. SSBI ensures that non-technical users don't have to depend on BI or IT team for a lot of their day-to-day information needs. For example, if a new dashboard or report has to be created based on a previously built data foundation layer (tables are connected using the right keys, correct relationships are maintained, etc.), or based on a csv or excel file, in that case end user (refers to BI user) doesn't have any dependency on the BI team and can go ahead and create it. But if a new data source, example, a new CRM system has to be integrated into the data warehouse, end users depend on BI team.

Currently almost all BI vendors offer some sort of SSBI capabilities.

Usually the BI team setup/enable this self-service by creating governed and metadata-based reporting using various tools like Business Objects, MicroStrategy, Cognos, etc., at the frontend (user access) of the BI solution. Usually there are other tools (ETL, RDBMS) at the backend of the BI solution. The features that are generally available for an end user as part of SSBI are listed as follows:

- Intuitive user interfaces with drag and drop functionality

- View, create, edit, save, and download artefacts such as reports and dashboards

- Possibility to create metrics, dimensions, aggregates, groups, filters, etc.

- Schedule reports

- Connect to approved data sources and upload data files

- Carry out all types of analytics (descriptive, predictive, and prescriptive)

- Share and collaborate with other users

- Prepare data for visualization and analysis

- Blend data from multiple data sources

And finally let's look at SSBI from a Walget's end user's perspective with an example. Store manager is one of the end users of BI. His responsibilities include managing the store staff, dealing with customers, customer complaints, suppliers, local authorities, etc. Let's assume that there exists a dashboard that shows which are the top 5 products sold in that store on a daily, weekly, monthly, quarterly, and yearly basis. Assume that the following situation arises, for reasons beyond his control one of the top 5 products is no longer supplied by the supplier. He would now like to know which is the best replacement for that missing product. He needs to ensure that store profit does not get impacted negatively with this change in product. He is aware that other stores of Walget have tried three different replacements for that product. Which of the 3 products have done well? To find the answer for this, if the data of other stores is already available in the BI platform and approved for his use for comparison, then using SSBI capabilities he will be able to drill down and find the best replacement for the product backed by actual data without having to wait for Walget's BI team to find the answer, and thereby will be able to make quicker decisions. In another scenario, let's assume that Walget decided to migrate its database from one provider (deployed on-premises) to another database provider (database-as-a-service). All of the backend changes to adapt the data warehouse to the new database are carried out by the BI team and not by the store manager. This example should help you in understanding the important role SSBI plays and at the same time also clarify the limitations or scope of SSBI.

Conclusion

In this chapter we have covered various types of BI based on different parameters such as type of analytics, type of decisions, solution hosting, solution ownership, type of software license, data freshness, sectors, departments, and based on BI integration approach. It's useful to be aware of these types to be in a position to choose the right type. It is to be noted that even though considerable effort has been made to cover all possible BI types, there are possibilities that a couple of types or

variants are unintentionally missed out. We have also covered differences between some of the types of BI and also learnt the advantages and disadvantages of some types over others. And finally, quite a few misconceptions related to real-time BI and self-service BI have been clarified.

This chapter together with the previous two chapters lays a good foundation on BI by covering detailed definition of BI, need for BI and types of BI, respectively. After having understood the importance of BI and so many types of BI available to choose from, do you see any challenges in organizations going ahead with a BI project or a program or an initiative? Do you think there can be any reason why some employees could even be against BI initiatives? Before starting with next chapter, can you think through and come up with a list of challenges in BI?

In the next chapter we will deal with some of the common challenges faced in business intelligence.

Points to remember

Some of the key points to remember are listed as follows:

- Types of BI depend on the parameter we choose for classification.

- Based on type of analytics, BI is classified as:
    o   Descriptive BI
    o   Predictive BI
    o   Prescriptive BI

- Diagnostic BI is an extension of descriptive BI. It answers why something has happened.

- Forecasts are predictions that are based on current state, calculated and involves time dimension. All forecasts are predictions, but all predictions are not forecasts.

- Based on type of decisions, BI solutions are classified as:
    o   Strategic BI
    o   Tactical BI
    o   Operational BI

- All three types of decisions could be possible from the same BI solution too.

- Four main logical layers of BI are:
    o   Data acquisition layer
    o   Data processing layer

- o Data storage layer
- o Information presentation layer
- Based on solution hosting, BI solutions are classified as:
    - o On-premises BI
    - o Cloud BI
    - o Hybrid BI
- When the components or logical layers of BI are spread across on-premises and cloud it's called hybrid BI.
- There are several variants within cloud BI and within hybrid BI.
- Based on solution ownership BI solutions are classified as self-managed BI and BIaaS.
- Based on software license type BI solutions are classified as
    - o Proprietary BI
    - o OSBI
    - o Mixed source BI
- Data freshness, in short, is the duration between the time of generation of the data and the time by when that data is processed, ready and available for BI purposes.
- "*Real-time BI is a must have for every business*" is a myth.
- There are sector specific BI solutions, for example, Retail BI.
- There are department specific BI solutions, for example, Human Resources BI.
- Based on BI integration approaches they are classified as Embedded BI and Standalone BI.
- There are more varieties of BI implementations such as: Agile BI, OOTB, and Self-service BI.
- OOTB BI is different from embedded BI.
- Self-service BI is a very important capability in all BI tools.

Multiple choice question

1. **"What is the percentage increase in the average spend per customer at Walget in the last month compared to previous year same month?" Which type of analytics answers this question?**

   a) Descriptive

   b) Predictive

   c) Prescriptive

   d) All of the above

2. **Walget is about to open a new store and they want to ensure they have the right number of staffs for the first week, which type of analytics should they use?**

   a) Descriptive

   b) Predictive

   c) Prescriptive

   d) All of the above

3. **Management at Walget is deciding about a multi-year multi-million-dollar supplier contract. Which type of BI supports in this decision-making process?**

   a) Operational BI

   b) Tactical BI

   c) Strategic BI

   d) None of the above

4. **In one of the Walget stores, a store manager finds out that one of the products will expire in the next 2 days. Which type of BI supports the store manager in arriving at a clearance price for that product?**

   a) Operational BI

   b) Tactical BI

   c) Strategic BI

   d) None of the above

5. **Which of these is not one of the logical layers in a BI solution?**

   a) Data acquisition layer

   b) Data storage layer

c) Data processing layer

d) Data presentation layer

6. **If the data acquisition layer and data processing layer is in the cloud and the data storage layer and information presentation layer is located on-premises, what type of BI is it?**

a) On-premises BI

b) Cloud BI

c) Hybrid BI

d) None of the above

7. **Which type of decision-making is mostly hindered without real-time BI?**

a) Strategic

b) Tactical

c) Operational

d) None of the above

8. **Walget would like to find out why there is a higher attrition rate in one of the regions? Which type of analytics should they use?**

a) Descriptive

b) Predictive

c) Prescriptive

d) All of the above

9. **Walget's BI solution is up to date with data by 7 AM local time every day. If a transaction happens at 5 PM local time, what is the maximum data freshness of that transaction?**

a) 2 hours

b) 2 days

c) 1 day

d) 14 hours

10. **Walget's BI solution is partially down because of unplanned maintenance and only today's data is available. Should top management rely on today's data for strategic decisions?**

a) Yes, this is the best they have today

b) No, today's data may not be in sync with the trend

c) It depends on the style of management

d) None of the above

Answers

1. a
2. d
3. c
4. a
5. d
6. c
7. c
8. a
9. d
10. b

Questions

1. Why diagnostic BI is not included along with the other three types of BI?

2. Why are all predictions not forecasts? Explain with an example.

3. What can be the reasons for choosing a multi-cloud approach for a BI solution?

4. Which one should Walget choose? Proprietary BI or open-source BI? And why?

5. Explain three known myths about self-service BI